Influence of outdoor surfaces on impact and shock absorption in novice and well-trained runners

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Abstract

It is presently unclear whether well-trained athletes use different biomechanical strategies to adapt to differences in surfaces compared to non-trained individuals. The aim of this study was to investigate if impact acceleration, stride-to-stride variability of peak acceleration and shock absorption were different between two groups with a different training background on frequently used outdoor running surfaces. Twelve female well-trained runners and 11 novice female runners performed a running test on a woodchip trail, concrete road and synthetic track. Acceleration data were acquired using an accelerometer placed on the shank and one on the forehead. Results showed that surface type had an influence on the impact (Figure 1) and stride-to-stride variability in the well-trained group and on stride-to-stride variability and shock absorption in the novice group. On the synthetic track impact was lower in the novice group compared to the well-trained group (Figure 1). Stride-to-stride variability was higher in the novice group compared to the well-trained group on all surfaces while no differences between groups were found for shock absorption. Running speed was different between groups and between surfaces, which influenced results on impact and shock absorption. In a speed-adjusted model, stride-to-stride variability was higher on the woodchip trail compared to the concrete road and synthetic track in both groups. Results from this study provide important insight in the effect of surface characteristics on several injury-related parameters. Novice runners should pay attention to the higher stride-to-stride variability when running on tracks like the woodchip trail since this can be a cause of injuries related to a reduced consistency and potential higher peak impact during some steps. Therefore, it might be better to have them run on a more stable surface at a lower speed. Runners and coaches should bear in mind that running on a stiffer surface will make them run faster and increase impact. Running on a more compliant surface therefore does not necessarily result in lower impact values. When running speed increases, shock absorption percentage does not. Consequently, the musculoskeletal tissues of the leg and the trunk will be under more stress as the running

speed increases. This is of particular importance for people who are sensitive to injuries such as lower back, knee or hip injuries.

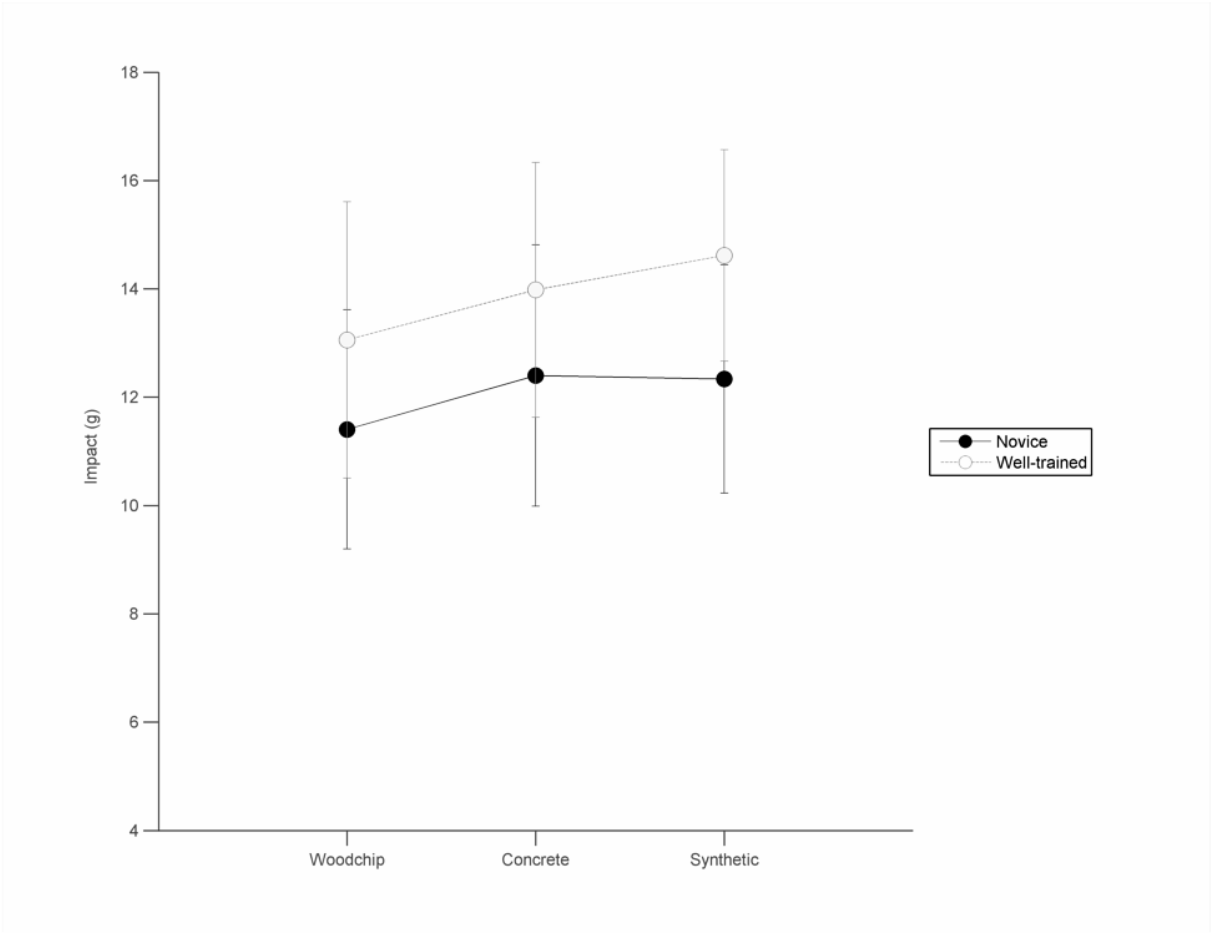

*Figure 1: Peak impact for both groups on all surfaces (mean + standard error). * = p<0.05 between surfaces, $ = p<0.05 between groups*